estimate rather than an exact count. All of the Myxomycetes show 8 as the x number; in the diatoms only 3 genera are cited, the x numbers being 4, 8, and 64, the latter with 128 as the $2x$ number; in the Conjugatae 12 is the prevailing number, and in most cases the $2x$ is not cited; in the Chlorophyceae the x numbers are various, ranging from 6 to 32, but no $2x$ numbers are given; in the Phaeophyceae the x numbers are 16, 18, 22, 24, and 32, with the expected $2x$ numbers; in Characeae the x numbers are 21 and 16, but no $2x$ numbers are cited; in Rhodophyceae 8 forms are given, with x numbers ranging from 7 to 24 and with the corresponding $2x$ numbers. In the fungi the numbers are low and the $2x$ numbers are given in comparatively few cases; the minimum x number is 2, and it has been noted in 2 species; 4 appears in 24 species; very few have more than 8 as the x number; and the maximum number (16) is cited in 6 cases. In the bryophytes 8 is the prevailing x number, having been noted in 12 species, while 4 has been counted in 6 species, and 12 in one case and 6 in another. The $2x$ numbers have been counted in nearly all cases. In the mosses the x number ranges from 6 to 24, with 6 (counted in 6 species) as the prevailing number. In the pteridophytes the numbers are comparatively high, the x number ranging from 4 to 120, and 24 of the 35 species cited have 32 or more, while only one (*Salvinia*) shows the minimum number. In the gymnosperms 12 and 24 have appeared so constantly as the x and $2x$ numbers that any other countings need to be very thoroughly supported; 34 species with 12 as the x number are cited, and 3 which are cited as having 8 chromosomes are now known to have 12, but there are still 6 species in which the number 8 has not been disputed. Other numbers are 6, 10, and 16. Of the 44 pages of citation, 28 are devoted to angiosperms. The x number ranges from 3 in *Crepis virens* to 45 in *Chrysanthemum arcticum*. The average number is higher in the dicotyledons than in monocotyledons, and the most frequent x numbers are 8, 12, and 16.

The list is valuable not only for the systematically arranged citations of chromosome counts, but also because it brings together a considerable portion of the cytological literature in which the chromosome appears either as a principal or as an incidental feature.—CHARLES J. CHAMBERLAIN.

Stomatal regulation.—From rather extensive experimentation upon ivy and laurel (*Prunus Laurocerasus*), DARWIN[9] concludes that transpiration is regulated by size of stomatal aperture, and that "LLOYD's dictum 'their (stomates) regulatory function is almost nil' " must be abandoned. The stomatal aperture was determined by use of his well known potometer, which determines the rate of flow of air through the stomates under a given pressure. The rate of transpiration was determined by weighing or by use of the potometer. Modification of stomatal aperture was induced by normal daily changes or

[9] DARWIN, F., On relation between transpiration and stomatal aperture. Phil. Trans. Roy. Soc. London B **207**:413–437. 1915.

by shorter periods of darkness and light. Humidity of the air was figured to a standard.

Potometer determination of stomatal aperture involves mass movement of air through the stomates under differential pressure, while transpiration involves static diffusion of water vapor through the stomates. To clear up the physics of the problem, DARWIN gives two quotations from Sir J. LARMOR: "The speed of diffusion through a narrow aperture between two open spaces is proportional to its diameter. The speed of a stream of air through such an aperture, between open spaces having different pressures on them, is proportional to its area if the effect of viscosity can be neglected, but proportional to the $\frac{3}{2}$ power of its area if viscosity is preponderant. Which of these conditions prevails, or whether the circumstances are intermediate, in a given case, depends upon the diameter of the aperture." "Diffusion through a long pipe or channel varies as the area, and flow through it depends upon a reduced area owing to the flowing air adhering to the walls of the tube; in fact it varies as the square of the area if viscosity is predominant. Thus if this be the case, provided the channels are of fairly uniform width, transpiration would be proportional to the square root of flow, the same law as that obtained for the case of holes in a thin plate." DARWIN believes the second assumption most nearly represents the situation, for the first applies only to tubes whose lengths are less than one-fifth of their diameter. As might be deduced from either of the physical laws just stated, the author has made one curve by plotting the square root of the rate of potometer flow, and another by plotting the rate of transpiration for various stomatal apertures, and for 18 separate experiments finds general agreement between the curves, although there are many minor discrepancies.

One regrets that the experiments were not carried out in closely controlled temperature and humidity conditions, which might go far to eliminate minor discrepancies. Evaporimeter records and measured light intensities might also aid in explaining these discrepancies. Much has been done since 1900 to put the material and energy exchanges between the leaf and the air upon a sound physical basis, and this is a noteworthy step in that direction. One is impressed by the excellent scientific spirit of the writer, and by the considerate way in which he deals with those who differ from him.—WM. CROCKER.

Sweet potatoes during storage.—HASSELBRING and HAWKINS[10] made a study of the course of the carbohydrate transformations in sweet potatoes (*Ipomoea Batatas*) during storage. The data indicated that a more rapid transformation of starch into sugar took place immediately after the roots were dug than at subsequent periods. This suggested intensive investigation relative to the effect of cessation of leaf activity and the effect of different temperatures on the progress of carbohydrate transformations. The study was

[10] HASSELBRING, H., and HAWKINS, L. A., Carbohydrate transformations in sweet potatoes. Jour. Agric. Research 5:543–560. 1915.